**Period: \_\_\_\_\_\_\_\_**

**Quadrilateral Project**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

~RUBRIC~

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Shape (20 pts total)** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence +   correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Parallelogram** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence +correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Rhombus** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Square** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Rectangle** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Kite** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Trapezoid** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown * Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Isoceles Trapezoid** | **Definition**  **(1 pt)**   * Correctdefinition (complete sentence + correct grammar) | **Side Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Angle Properties**  **(5 ps)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Diagonal Properties**  **(5 pts)**   * Correct calculations w/ all work neatly shown * Correct proof w/ all work neatly shown, if required   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) | **Perimeter/Area**  **(4 pts)**   * Correct calculations w/ all work neatly shown   Correctgeneral statement (conclusion + why) about properties in final summary (complete sentence/grammar) |
| **Total Points: \_\_\_\_\_ / 140** | | | | | |

**~QUADRILATERAL PROJECT~**

The goal of this project is for you to OWN your learning of quadrilaterals. You will do this by first calculating the properties in the coordinate plane. This will be considered the inductive step because we are making a conjecture about a quadrilateral property based on our calculations. Next, you will complete a proof of the property. This will be called the deductive step because you are proving that the properties hold for ALL quadrilaterals, not just the one you calculated for.

So, for each quadrilateral:

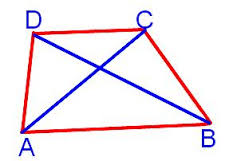
* Initial Induction (calculations in coordinate plane for one specific example)
* Final Deduction (generalized proof that property holds true for all quadrilaterals)

**~RULES~**

* Leave all answers in simplified radical form (when possible)
* All work must be shown
* Summaries must be in complete sentences
* NONONONO CALCULATOR! (unless you need it for trig)

**~DEFINITIONS~**

Read the basic terms and definitions below.



1. A quadrilateral is a four-sided polygon
2. Opposite angles do not share a side
3. Opposite sides do not share a vertex
4. Adjacent sides share a vertex
5. Consecutive angles share a side
6. A diagonal is a line segment connecting two-non-adjacent vertices in a polygon.

**PARALLELOGRAM**

Parallelogram JKMN has the coordinates J(-7, 3); K(7, 3); M(5, -1); N(-9, -1).

1. Define parallelogram
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Final Deduction
      1. Prove: If a quadrilateral is a parallelogram, then its opposite sides are congruent



* 1. Write a general statement about property/properties for final paragraph

1. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
      2. Determine if consecutive angles are supplementary
   2. Final Deduction
      1. Prove: If a quadrilateral is a parallelogram, then its opposite angles are congruent



* + 1. Prove: If a quadrilateral is a parallelogram, then its consecutive angles are supplementary

|  |  |
| --- | --- |
| Prove: is supplementary to  is supplementary to |  |

* 1. Write a general statement about property/properties for final paragraph

1. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
   2. Final Deduction
      1. Prove: If a quadrilateral is a parallelogram, then its diagonals bisect each other



* 1. Write a general statement about property/properties for final paragraph

1. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area
   2. Final Deduction
      1. Is there a formula? Why?
   3. Write a general statement about property/properties for final paragraph
2. Final summary of all properties in a parallelogram

**RHOMBUS**

Rhombus PQRS has the coordinates P(-2, 3); Q(7, 6); R(4, -3); S(-5, -6).

1. Define rhombus.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
         1. *Hint: Find the equation of a line for SR. Use the slope of SR to write the equation of a line perpendicular to SR. Find the equation of a line for PQ. Set the equations equal to each other to find their intersection.*
         2. *Find one angle and use parallelogram angle properties to find the remaining angles*
      2. Determine if consecutive angles are supplementary
   2. Write a general statement about property/properties for final paragraph
4. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
      4. Determine if diagonal bisects a pair of opposite angles
   2. Final Deduction
      1. Prove: If a parallelogram is a rhombus, the each diagonal bisects a pair of opposite angles.



* 1. Write a general statement about property/properties for final paragraph

1. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area
   2. Final Deduction
      1. Use the area of triangles to show why the area of a rhombus can be found by: ½\*d1\*d2, where d1 is the first diagonal and d2 is the second diagonal
   3. Write a general statement about property/properties for final paragraph
2. Final summary of all properties in a rhombus

**SQUARE**

Square VWXY has the coordinates V(-4, 2); W(1,4); X(-2,-3); Y(3,-1).

1. Define square.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
      2. Determine if consecutive angles are supplementary
   2. Write a general statement about property/properties for final paragraph
4. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
      4. Determine if diagonal bisects a pair of opposite angles
   2. Write a general statement about property/properties for final paragraph
5. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area
   2. Final Deduction
      1. Is there a formula? Why?
   3. Write a general statement about property/properties for final paragraph
6. Final summary of all properties in a square

**RECTANGLE**

Rectangle ABCD has the coordinates A(-6,1); B(6, 4); C(-5, -3); D(7, 0).

1. Define rectangle.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
      2. Determine if consecutive angles are supplementary
   2. Write a general statement about property/properties for final paragraph
4. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
      4. Determine if diagonal bisects a pair of opposite angles
   2. Prove: If a parallelogram is a rectangle, then then its diagonals are congruent.



* 1. Write a general statement about property/properties for final paragraph

1. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area
   2. Final Deduction
      1. Is there a formula? Why?
   3. Write a general statement about property/properties for final paragraph
2. Final summary of all properties in a rectangle

**KITE**

Kite ABCD has the coordinates A(-3, -2); B(2,1); C(4, -2) and D(2, -5)

1. Define kite.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
      2. Determine if consecutive angles are supplementary
   2. Write a general statement about property/properties for final paragraph
4. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if one diagonal bisects the other diagonal
         1. *Hint: label the diagonal intersection X. Find the midpoint of BD. Find the distance of BX and DX.*
      3. Determine if diagonals are perpendicular
      4. Determine if diagonal bisects a pair of opposite angles
   2. Final Deduction
      1. Prove that if a quadrilateral is a kite, then its diagonals are perpendicular.



* + 1. Prove that if a quadrilateral is a kite, one pair of opposite sides are congruent.



* + - 1. *Hint: Draw diagonal FH*
  1. Write a general statement about property/properties for final paragraph

1. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area
   2. Final Deduction
      1. Use the area of triangles to show why the area of a rhombus can be found by: ½\*d1\*d2, where d1 is the first diagonal and d2 is the second diagonal
   3. Write a general statement about property/properties for final paragraph
2. Final summary of all properties in a kite

**TRAPEZOID**

Trapezoid ABCD has the coordinates A(-9, -2); B(-4, 8); C(8, 8) and D(10, -2)

1. Define trapezoid.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
   2. Write a general statement about property/properties for final paragraph
4. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
   2. Write a general statement about property/properties for final paragraph
5. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area (by using triangles)
   2. Final Deduction
      1. Find the formula for area of a trapezoid. Why is this the formula?
   3. Write a general statement about property/properties for final paragraph
6. Final summary of all properties in a trapazoid

**ISOSCELES TRAPEZOID**

Isosceles Trapezoid ABCD has the coordinates A(0, -2); B(9, 1); C(4, 6) and D(1, 5)

1. Define isosceles trapezoid.
2. Side Properties
   1. Initial Induction
      1. Determine which sides are congruent
      2. Determine which sides are parallel/perpendicular
   2. Write a general statement about property/properties for final paragraph
3. Angle Properties
   1. Initial Induction
      1. Determine which angles are congruent
      2. Determine if consecutive angles are supplementary
   2. Final Deduction
      1. Prove that if a quadrilateral is a isosceles trapezoid, then its base angles are congruent



* + 1. Hint: AE has been drawn in such that 
  1. Write a general statement about property/properties for final paragraph

1. Diagonals
   1. Initial Induction
      1. Determine if diagonals are congruent
      2. Determine if diagonals bisect each other
      3. Determine if diagonals are perpendicular
   2. Final Deduction
      1. Prove that if a quadrilateral is a isosceles trapezoid, then its base angles are congruent



* 1. Write a general statement about property/properties for final paragraph

1. Perimeter and Area
   1. Initial Induction
      1. Find the perimeter and area (by using triangles)
   2. Final Deduction
      1. Find the formula for area of a trapezoid. Why is this the formula?
   3. Write a general statement about property/properties for final paragraph
2. Final summary of all properties in an isosceles trapezoid